

PCS, also can perform location functions when combined with GPS. Each of these services offers a different degree of accuracy and reliability, particularly in urban environments. Not all are appropriate for each need that location services and IVHS attempt to meet. However, LMS systems provide location, voice and data services from a single radio unit and thus provide a uniquely efficient service.

User selection of accuracy and service capability will also obviously consider cost. While wideband systems such as MobileVision's can offer voice communications ancillary to location, as noted above, they cannot compete with cellular on a per call cost (nor do they have the capacity to compete for such service). If voice is the primary requirement and location is only secondary, a cellular phone, SMR or PCS with a GPS (or wideband) device may be the choice. In this mix of alternatives, wideband pulse ranging LMS systems offer the location function, in all environments, as primary and provides the necessary ancillary communications to satisfy market and IVHS requirements.

**V. TELETRAC'S SUBMISSION IS ANTICOMPETITIVE AND TOTALLY FAILS TO ACHIEVE THE OBJECTIVES OF THIS RULEMAKING**

During the almost two years since it filed its Petition seeking permanent rules and initiating this rulemaking proceeding, Teletrac has vigorously advanced its position that wideband pulse-ranging LMS systems require co-channel exclusivity. It has steadfastly held to this position through numerous filings of Comments, Oppositions, Reply Comments, Technical Appendices, and Affidavits in support of its Petition and in response to the Commission's NPRM, as well as through its many ex parte communications and submissions to the staff. While there have been numerous differences in the particulars of MobileVision's and Teletrac's positions, MobileVision has consistently supported the essence of Teletrac's Petition and its subsequent filings with regard to the need for

technically sound rules that insure that LMS services can be provided without destructive interference, because this position is technically and scientifically correct.

Now, Teletrac would have the Commission consider one 10 MHz band allocated to wideband pulse ranging LMS systems, on a direct overlay basis, and not surprisingly only on the same frequencies for which Teletrac's system has been licensed and engineered (as opposed to those frequencies on which all of its potential competitors have been licensed and for which their systems are being, or have been, designed). The "sharing" that Teletrac suggests is a hybrid of shared and unshared frequencies and, by their own admission, only capable of accommodating two systems in each market. Yet that proposal would cannibalize the wideband portions of the LMS band to the detriment of spectral efficiency, capacity and the required ancillary services. Moreover, Teletrac urges the adoption of rules that are specifically designed to Teletrac's own intended use of forward link and limited ancillary services.

**A. Teletrac's Submission Is In Contradiction To Its Own Technical Experts And Its Prior Positions In This Proceeding**

Teletrac's submission abruptly abandons the truth of all Teletrac's previous positions on the core issues in this proceeding, effectively disclaiming without explanation its own technical testimony and discarding that of its well known and respected experts. In this proceeding, for example, Teletrac submitted the Pickholtz Statement, dated June 28, 1993, that opposes, for a variety of reasons, the type of spectrum sharing scheme that Teletrac now proposes, including the inefficient use of spectrum that would result.

Teletrac's previously consistent position on the inadequacies of sharing dates back to its Petition (p. 29, ¶ 41) and has been restated repeatedly with accompanying technical support and affidavits during the past two years:

- ° Teletrac Reply Comments in Support of Petition for Rulemaking, August 7, 1992, pp. 30 et seq. ("[O]pen entry and sharing between AVM providers is not technically or commercially feasible and would inhibit innovation in this environment." Executive Summary, p. ii.)
- ° Affidavit of Dr. Charles L. Jackson submitted with Reply of Teletrac in In the Matter of Pinpoint Communications, Inc., April 8, 1993.
- ° Teletrac's Application for Freeze, May 21, 1993, p. 9, ("[s]haring between wideband systems is important at best and impossible at worst").
- ° Teletrac Comments, June 29, 1993 (pp. 24-40) and attached Pickholtz Report as well as Report of Richard Schmanlensee (The Economics of Co-Channel Separation for Wideband Pulse Ranging Location Monitoring Systems).
- ° Teletrac Reply Comments, July 29, 1993, pp. 20 et seq. ("[C]o-channel separation is a necessity for wideband pulse-ranging systems if they are to operate accurately and efficiently. Sharing regimes would seriously degrade LMS service and impose substantial costs without any public benefit.")

Teletrac has provided no adequate technical or scientific explanation for its change of position on this critical issue.

MobileVision submits that Teletrac's newly proposed rules are totally without merit and do not withstand the rigor of sound engineering analysis. They contain no supporting analysis and are replete with contradictory and confusing rules and abbreviations, which are likewise inadequately supported and unexplained. While MobileVision has attempted to review Teletrac's proposal carefully, it will await clarification of Teletrac's proposal through the comment process to offer detailed scientific analysis on its deficiencies. Suffice it to say that the system of licensing proposed by Teletrac is inadequate to meet LMS needs to serve the IVHS market and is not technically sound. Moreover, if adopted, the Teletrac allocation and licensing scheme would render unusable MobileVision's ten years of pioneering effort, \$50 million in development effort and \$7.5 million in fixed site and mobile equipment designed to work on the frequencies for which it is licensed. Not only would MobileVision lose all of its investment and be unable to deploy

its system, but the public would fail to benefit from the services it has to offer if Teletrac's system is adopted or any other that does not preserve the 8 MHz bands established by the Interim Rules.

**B. Teletrac's Submission Is Monopolistic In Effect**

An examination of the practical effects of Teletrac's Submission and the current state of the industry suggests why Teletrac has reversed its position. Teletrac and MobileVision possess the only fully developed wideband pulse ranging systems: Teletrac's is in service in six markets and MobileVision has its system infrastructure in place in three markets and is currently poised to fully deploy its systems after the completion of a capital infusion, which is believed to be imminent, provided that the permanent rules do not restrict the necessary ancillary voice and data services.

Teletrac has publicly reported that it has experienced limited commercial success in its initial markets.<sup>13</sup> While Teletrac is reported to be re-engineering its systems to provide voice capability to address actual market needs, it would have the Commission prevent or hinder others from encroaching on its markets by urging rules designed to fit only its system. Indeed, as Teletrac has been advised, the adoption of its proposal would require MobileVision not only to redesign its system, a system fully developed in reliance on existing rules and ready for deployment in markets in which it would compete head on with Teletrac.

The remarkable, but natural and inevitable, consequence of adopting Teletrac's submission will be the creation of a monopoly in wideband LMS systems for Teletrac for years to come. But not only will the public be harmed by the absence of competition, it will

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<sup>13</sup> In disclosures contained in an August, 1993 public offering prospectus, Pactel Corporation, a 51% shareholder of Teletrac through its subsidiary Location Technologies, Inc., stated that "Teletrac's . . . services have not yet achieved a significant degree of commercial acceptance."

be precluded under Teletrac's submission from receiving the IVHS related and other services the market demands and which MobileVision's technology is today capable of delivering. It cannot be that Teletrac is unaware of these consequences.<sup>14</sup> Obviously, those consequences are to be avoided.

Indeed, Teletrac's proposal appears singularly designed to allow it to provide service to one market segment, primary emergency roadside service, rather than to the range of broader public requirements for IVHS and other services. Both Teletrac and MobileVision are pursuing arrangements with national accounts, including automobile manufacturers, for incorporation of LMS equipment in connection with serving those customers and meeting the needs of those accounts. Teletrac's technical proposal would provide it with the bare minimum to remain eligible in that competition but as designed would preclude MobileVision from competing for the potential national accounts. Teletrac's Submission regarding emergency voice, which appears designed for this singular purpose, would also preclude MobileVision and others from serving other important market needs, such as fleet management. As a result of the technical and capacity restrictions Teletrac proposes, neither Teletrac nor MobileVision nor others could effectively offer services competitive to other segment providers in the location markets, such as GPS when combined with cellular, SMR or PCS. The result would be, if Teletrac's proposal were adopted, that, contrary to the Commission's specific intention, IVHS services will not be provided by wideband LMS service on the 902-928 MHz spectrum that is the subject of this rulemaking.

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<sup>14</sup> In addition to the market benefits to be derived by Teletrac from adoption of its latest proposal, its reversal of position may reflect its concerns that the basic framework of two 8 MHz bands contained in the Interim Rules and NPRM may be modified. Such a modification, if considered, would be contrary to the purpose of the NPRM and render LMS incapable of serving market and IVHS needs.

**VI. SOUTHWESTERN BELL'S SUBMISSION IS TECHNICALLY UNSOUND AND IGNORES THE PUBLIC INTEREST IN PRESERVING THE AVAILABILITY OF NON-CELLULAR LMS SERVICES**

Southwestern Bell has provided in its submissions an interim report by the Mobile and Portable Radio Research Group ("MPRG") at Virginia Tech. The MPRG report reaches qualitative conclusions that purport to validate positions taken by Southwestern Bell in this proceeding and support Southwestern Bell's proposed LMS licensing scheme. Preliminarily, it should be noted that the MPRG report specifically states it is not based on any first hand empirical data (either developed by MPRG or Southwestern Bell) or on experience based on system operational conditions. The MPRG review is an academic exercise based solely on "relevant technical literature."

Attached hereto as Annex 4 is a Technical Review of the MPRG report. A number of important conclusions of the report are consistent with MobileVision's field testing and experience. For example, MobileVision agrees that direct overlay or time sharing by separate systems within the same spectrum is "unworkable" and is "not a viable option" and that providers must have control of the frequencies on which they operate in order to permit forward scheduling and meet other system requirements. In addition, the report correctly identifies the "near/far problem" as a source of performance degradation. Furthermore, as MobileVision has indicated in its prior filings, the MPRG report makes it clear that traditional power control solutions will not eliminate that degradation and may exacerbate it. MobileVision also agrees that indoor users of Part 15 devices will not experience significant interference from LMS providers but that the potential exists for such interference in connection with outdoor Part 15 devices.

MobileVision disagrees, however, and the MPRG report does not, on analysis, support its own conclusions (and the Southwestern Bell licensing position), that operation

of two adjacent systems, each in the other's sideband, is practical. Nor does it agree that the disadvantages in splitting the 8 MHz band into two 4 MHz channels are "insignificant." That disagreement is based on contrary evidence from MobileVision's extensive development efforts and field results.

Contrary to the MPRG report and prior Southwestern Bell submissions, and as discussed in detail in Annex 4, sidelobe interference will exist when two adjacent LMS systems operate in the same 8 MHz band. Indeed, instances of interference, hardly "negligible" as denominated by MPRG, will occur throughout the LMS service area whenever one system's mobile unit is within as much as 2.6 miles of a receiving site of the other system. Likewise, contrary to assertions in the MPRG report and prior Southwestern Bell submissions that spectrum fragmentation will not produce serious disadvantages, splitting the 8 MHz band into two 4 MHz bands will reduce the location capacity by a factor of four and data capacity by a factor of two. In addition to the reduction in needed capacity, the fragmentation of the frequency band reduces significantly the ability of the LMS system to resolve multipath signals and ensure reliability of location functions.

The MPRG report and the restatement of the Southwestern Bell proposals contained in its Submissions does not consider market requirements. Southwestern Bell, as a cellular provider, has alternative, but more expensive, means to address the voice and data services needed to satisfy IVHS objectives (such as ATIS and CVO), and to meet market requirements for fleet and consumer services. As set forth in Section II, above, non-cellular LMS providers must have independent capacity for such services.

**VII. THE PINPOINT TEST RESULTS DO NOT DEMONSTRATE THE COMPATIBILITY OF CO-CHANNEL NARROWBAND AND WIDEBAND SYSTEMS**

The Pinpoint Submission consists of a review of test results by Hatfield Associates. The Pinpoint "test," designed to demonstrate the feasibility of wideband/narrowband sharing, was conducted in Washington, D.C. in the fall of 1993. In this trial, a compact cluster of stations was set up, all stations located within three miles of each other, and a tight circular route was used as the test route. An Amtech toll booth system was also set up in order to measure the mutual interference. The conclusions drawn from the test results, as presented, are misleading. Results, when analyzed, show that MobileVision's analysis, detailed in Annex 3 of its July, 1993 Reply Comments, is accurate and that Amtech, Pinpoint and other AVM systems all will suffer from significant interference if sharing is imposed between the wideband and narrowband providers (and among the wideband providers). They also show that Pinpoint's system, if operated in compact clusters as demonstrated and on the high power levels Pinpoint urges, will be the most devastating system to Part 15 users within the band.

The Pinpoint test parameters do not even loosely approximate the operating conditions of wideband LMS providers. Attached as Annex 5 hereto is a technical critique of the Pinpoint Submission. Included in it is a depiction of the Pinpoint test sites compared to site locations that would be utilized in actual operating conditions. (The latter are consistent with the actual distances between Pinpoint licensed sites in Ft. Worth where Pinpoint intends to establish its first system.)

But even with the artificially set parameters, the Hatfield Review, accurately analyzed, actually shows that the characteristics of the system tested are:

- Poor mobile receiver sensitivity.



- Poor range on its forward link (only three miles, even though a 500W spread spectrum channel is used).<sup>15</sup>
- Poor jamming margin of only 5dB.
- Greater susceptibility than other wideband systems to interference from a local area (Amtech) system.
- A unique dead-zone in the vicinity of the local area (Amtech) system.

In fact, the test demonstrated clearly that the MobileVision technical analysis of the Pinpoint system (Annex 1 to MobileVision's Reply Comments) was accurate and the deficiencies of that system correctly noted therein. The Pinpoint Submission, in effect, is prime evidence that the basic allocation structure adopted in the Interim Rules was sound and should be continued. It also demonstrates that time sharing is a false solution to issues of spectrum utilization and competition.<sup>16</sup>

#### **VIII. ADOPTION OF RULES FOR LICENSING BY METROPOLITAN AND RURAL STATISTICAL AREAS HAS GREAT MERIT**

The Southwestern Bell Submission proposes a licensing scheme based on Metropolitan Statistical Areas (MSAs) and Rural Statistical Areas (RSAs). Thus, rather than licensing on a transmitter by transmitter basis in accordance with current practice, the Commission would issue licenses for predetermined geographical areas of substantial size. MobileVision supports this proposal.

Wide-area licensing has been adopted or is under consideration for adoption by the Commission in several communications services, notably cellular, SMR, common

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<sup>15</sup> As a result, there is a requirement to deploy more than four times as many stations to cover an area compared to MobileVision or any other wideband LMS system.

<sup>16</sup> See also Annex 3 on the deficiencies of time sharing between wideband LMS systems.

carrier paging, and most recently PCS. The advantages have been well-presented in those contexts and need only be summarized here.

Clearly, the certainty of a known service area with defined boundaries is preferable to ever-changing service areas based on the composite contours of licensed stations or on mileage separation tables. Both from the Commission's perspective in efficiently allocating its limited resources for the processing of applications, and from the licensee's viewpoint in maintaining current and up to date license files, a single authorization to serve a defined area is preferable. Such an approach eliminates the advantages to be gained from filing pre-emptive applications more for the purpose of preventing another licensee's expansion than to provide service of one's own. Speculation in authorizations is thus discouraged and systems can expand logically as the market demands. In short, licensees are not forced to anticipate competitive moves of other carriers with premature filings to preserve future growth opportunities.

Wide-area licensing would provide for greater flexibility in the design and implementation of LMS systems, and would provide for greater economies of scale and scope. MobileVision believes such a scheme would provide a convenient, orderly method to license LMS systems, and allow licensees the flexibility to expand their systems, provide service to the public expeditiously, and preserve valuable Commission resources.

Finally, MobileVision believes that it is not in the public interest to permit a licensee to protect unserved territory for an unlimited period of time in an area in which service is not provided. If some other carrier desires to serve such an area and the current licensee does not, the new carrier should be given an opportunity to serve customers in that unserved area.

The Commission can find precedent for such a scheme in its cellular rules. Initial cellular systems were granted a five year period during which the systems could be

expanded with the MSAs and RSAs free from the filing of competing applications. Subsequently, the Commission adopted rules for the acceptance, processing, and selection of applications for service to those areas where systems had not expanded and which remained unserved.

As with cellular, LMS systems will expand in response to market demand, as population centers expand and shift. The Commission's primary goal should be to facilitate the creation of seamless and integrated LMS networks which allow subscribers and customers to received service on wide-area, regional and nationwide bases. At the same time, the Commission should strive to make this service available to the public as expeditiously as possible. MobileVision supports the wide-area licensing scheme proposed by Southwestern Bell as a desirable and effective method by which to achieve these goals.

### **CONCLUSIONS AND RECOMMENDATIONS**

The Interim Rules adopted 20 years ago were the result of extensive technical fact finding lasting for two years. The basic allocation scheme represented in the Interim Rules reflects an understanding of technical considerations in the operation of wideband pulse-ranging LMS systems that are grounded in immutable laws of physics. These considerations are as valid today as they were when considered by the Commission in 1974. They dictate that wideband providers need 8 MHz on a protected basis.

Economic realities mandate the permissible provision of voice and data as ancillary services of such systems. The promulgators of the Interim Rules also foresaw that need and provided for it. To assure that there is no ambiguity in that regard, MobileVision recommends the adoption of the following definition of LMS in the permanent rules:

"The use of non-voice signalling methods from and to radio units to make known the location of such units. LMS systems may also transmit and receive ancillary voice and non-voice communications to and from the units being located."

The issues properly before the Commission at this time focus on developing a licensing scheme that will permit immediate deployment of systems without massive degradation of the service caused by interference. The spurious claims regarding the efficacy of time sharing or frequency fragmentation should be discounted. While MobileVision prefers the band allocations provided in the Interim Rules and the NPRM, to address legitimate concerns that have been raised by Part 15 users and narrowband providers as well as other commenters in this proceeding, MobileVision proposes the following alternatives to the recommendations set forth in the NPRM:

1. Reallocate the spectrum for wideband spread spectrum LMS providers to 902-910 MHz and 920-928 MHz and provide protection on such spectrum to the first licensee to build on each such band as set forth in these Further Comments. This reallocation should be expressly conditioned on the adoption of changes to the forward link allocations and the adherence to strict out of band emission limits in adjacent frequency bands as set forth below. Otherwise, the operation of LMS systems in the reallocated bands will not be possible.
2. Move the forward link for each wideband provider to the same provider's licensed 8 MHz bandwidth, subject to the grandfathering provisions set forth in these suggested changes, since with the shift of band allocation the current forward links will create intolerable interference.
3. Require strict adherence to out of band emission limits not only within 902-928 MHz band but in connection with users of the frequencies above and below that band.
4. While allowing Part 15 users on a secondary basis in the spectrum reserved for wideband LMS providers (902-910 MHz and 920-928 MHz), provide for narrowband LMS use and Part 15 use in the middle spectrum (910-920 MHz), as well as for any developmental licenses, thus providing for both a contiguous 10 MHz band for the narrowband users, as their comments suggest they need, and a safe haven for those Part 15 users that anticipate interference to or from wideband LMS providers. This allocation is consistent technically with

narrowband provider comments regarding their tolerance to interference from Part 15 users.

5. Establish tolerance standards for interference from Part 15 users in the wideband and narrowband allocated spectrum. In those isolated instances where existing Part 15 devices in use would interfere with wideband providers, even after coordination, in the 902-910 MHz and 920-928 MHz bands, require, as necessary, migration to the middle spectrum (910-920 MHz) or other spectrum outside the LMS band. Because such instances of required migration are anticipated to be minimal, MobileVision submits that wideband providers should be required to defray or absorb reasonable costs of migration to such frequencies where that cost is a hardship to existing Part 15 users existing on the Effective Date of the rules..
6. Permit wideband spread spectrum systems that claim and can demonstrate the ability to share with narrowband and Part 15 users the use of the middle band (910-920 MHz) on a secondary basis.
7. In those markets where system infrastructure has already been deployed or systems are operating on the current bands or with forward links in the other band allocated for wideband systems, the Interim Rules for allocation should be grandfathered until migration to the new sub-bands and forward links can be coordinated by the currently deployed or operating systems but in no event later than two years.

When two licenses exist in the same wideband allocation, the following rules should govern the avoidance of interference:

- Thirty days prior to commencement of system construction in any area, a wideband licensee that wishes protection from interference must file a certification indicating that its system is not a test/beta system and is currently capable of deployment on a commercially available basis to avoid frequency speculation schemes.
- Where two or more current licensees (i.e., entities holding licenses as of the date new rules are adopted) have provided certifications in a particular geographic area, the first wideband LMS system to construct a system in its authorized 8MHz band in that area, and offering service to the market, will be afforded protection from interference caused by other licensees or future LMS co-channel users that results in degradation of service at fixed sites or mobile units.
- Any subsequent LMS service providers proposing to provide service in the same frequency band and in the same service area must operate on a non-interfering basis with the first system entitled to interference protection.

In addition, the NPRM separation of wideband and narrowband systems reflected in the Interim Rules should be maintained but existing narrowband sites should be grandfathered after proper coordination with wideband providers.

This proposal is a refinement of the allocation and sharing alternatives outlined by the Commission in the NPRM. Protection against future interference extends to the LMS system operator that first constructs and provides service to customers. The only restriction on future LMS service providers is that they operate on a non-interfering basis. Constructed systems capable of commercial service at the time of the Report and Order should be considered to have provided the necessary certification and afforded the same protection from interference.

Concerns about adequate competition under the existing licensing scheme for two wideband systems per market have been overstated. Competition in location services is not merely among wideband LMS providers but between them and competing technologies. That competition will not exist, however, if LMS systems cannot address the market under economically viable conditions.

MobileVision believes that concerns about adequate competition can also be addressed in other ways. One alternative could be through licensing and resale of LMS services, briefly described thus:

- ° Each wideband system provider in a market would be required to resell system capacity to a maximum of two other competitors under conditions that will ensure the integrity of the service.
- ° At their option, resellers could buy their mobile equipment from the system provider or be licensed to manufacture and use such mobile equipment.

Consumers would benefit from the service alternatives thus provided by up to six LMS entrepreneurs per market. Competition would be served without the draconian adoption of forced time sharing that will reduce capabilities to a least common

denominator and make systems nonviable. Resellers who are cellular service providers could offer LMS services adjunct to their cellular systems, as resellers, without the fragmentation of the spectrum that would preclude service by full service wideband LMS systems.

MobileVision submits that each of its recommendations would improve the NPRM proposals and address legitimate concerns. The record in this proceeding is confused and contradictory. MobileVision's comments have been based on market studies, national account customer contacts and IVHS goals. Unlike the comments of the later entrants, its technical submissions throughout have been based on its expertise and actual field experience. The Teletrac Submission is so facially flawed and anti-competitive that it should be rejected out-of-hand. The only credible evidence in the record, therefore, mandates adoption of rules consistent with the recommendations herein.

If the Commission is not prepared to adopt MobileVision's proposals at this time, it should, in order to eliminate the confusion and ensure the economic and technical soundness of any Final Rules, conduct an informal technical meeting of the appropriate Commission personnel and the engineering and design expertise of the LMS providers to establish, through industry exchange and peer scrutiny, the full record of technical, economic and market requirements on which the future of the LMS industry rules should rest. During the period necessary to establish that record, the Interim Rules should continue in effect, and current license holders should be permitted to continue building out, with clear grandfathering provisions in the event permanent rules establish different conditions or restrictions on licensing.<sup>17</sup> MobileVision firmly believes that without a clearer

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<sup>17</sup> In any event, unless rules consistent with MobileVision's proposals are adopted, MobileVision should be permitted to construct and operate in licensed markets with equipment in inventory designed and built consistent with the requirements of the Interim Rules.

record addressing the real impediments of time sharing and the essential requirements of protection from interference, the resulting rules will fail to achieve the objectives of the NPRM and the public will fail to receive the benefits of wideband LMS services. As part of that informal meeting, having established the parameters of LMS operations, the providers of such services would meet with representatives of Part 15 interests to coordinate, as necessary, the use of the band by such entities pursuant to the Commission's rules.

MobileVision (and, for that matter, Teletrac) built its systems on one of two separate 8 MHz bands in reliance on Interim Rules existing for 20 years, in reliance on licenses granted under those Interim Rules, and in reliance on many pre-rulemaking communications with the Bureau regarding its intentions to design and build an 8 MHz system under the existing rules and the Commission's policies on protection from interference. Not only will it not serve the public interest to deprive potential LMS users of capable and viable systems that would compete with each other and with other technologies for location related services by wholesale (and technically unsound) revision of the existing licensing scheme, but it would be an unjust and unfair deprivation of years of efforts based on those reliances.

LMS systems are capital intensive. While the uncertainty of the status of the Interim Rules has impeded the attraction of that necessary capital, the principal impediment during this proceeding has been the divergent and misplaced comments of those who would argue for wholesale revision to the long standing regulatory framework on which MobileVision has constructed its system. These comments have raised concerns in the capital markets about the capacity of MobileVision or any other wideband LMS provider to achieve its service objectives and the breadth of services to be offered to meet market needs. These comments are based on the many different individual desires of commentators, who unlike MobileVision do not have systems ready to deploy. They should



not be allowed to impede immediate service to the public by the deployment of MobileVision LMS systems, the only systems ready for full scale national deployment with services necessary to meet public needs.


Over \$50 million of investment has been made in the development of the MobileVision system, and investors are ready to invest the millions more that it will take to deploy the system on a nationwide basis. But the past investment will be wasted and current investment will not be forthcoming, not to MobileVision nor to any other prospective LMS provider, if ill-conceived proposals, resulting in radical changes to the Interim Rules, are adopted and services desired by the marketplace cannot be economically offered. In that event, no wideband LMS provider will come forward in this spectrum capable of serving the public and IVHS needs. Rather than that, it would be far better for the industry and the public if the Interim Rules were merely continued in place, with changes only to provide interference protection mechanisms, and that this NPRM be suspended while the market and the industry define their needs further.

MobileVision believes, however, that delay in adopting permanent rules is unnecessary. To the contrary, it believes that rules can now be fashioned adopting the recommendations set forth in these comments that will serve the interest of the

marketplace and the national IVHS goals, while addressing the needs of LMS providers as well as the concerns of interested parties such as Part 15 users. It respectfully requests the adoption of such rules.

Respectfully submitted,

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## **Report on the Viability of Location Monitoring Services Technology within the IVHS Industry**

### **1.0 SUMMARY**

The purpose of this report is to address the viability of Location Monitoring Services (LMS), within the Intelligent Vehicle Highway Service (IVHS) industry. These services, (formerly known as AVM; Automatic Vehicle Monitoring), are particularly worth considering where there is a requirement for location information along with ancillary voice and/or data services. Personal safety, emergencies on the road, automobile theft and inefficient fleet management and highway usage are national problems that have a severe negative impact on the economy. The IVHS objectives relating to personal safety, vehicle protection, and fleet and traffic management are needs that LMS services can provide economically to the general public. As described in this paper, there are various types of IVHS services, such as Traffic Management, Traveler Information, Commercial Vehicle Operations and Public Transportation Systems. LMS systems such as MobileVision's, provide many of the component functions of IVHS systems.

The MobileVision system is an example of an LMS system that will meet the IVHS objectives as well as provide solutions for other consumer and commercial marketplace demands. While all the competing alternative technologies for providing IVHS services have individual advantages and disadvantages, the MobileVision LMS system as compared with other current and future wireless technologies is competitive with respect to cost, services and coverage.

The LMS industry, with location, ancillary voice and data services, competes favorably with other wireless technologies for IVHS needs where there is a basic requirement for location information.

## 2.0 IVHS OVERVIEW

The acronym IVHS is used to describe worldwide systems of wireless vehicle communications, navigation, and location services. Demand for IVHS products and services is driven by the fact that industrialized nations annually lose billions of dollars due to the lack of navigation-related information. IVHS America<sup>1</sup> reported that the hours of delay from traffic tie-ups and inefficient use of roadways translated into a monetary loss in 1991 of \$30 billion in the United States alone.

### 2.1 IVHS Objectives

While there is no single answer to the complex transportation problems that currently exist, use of IVHS technologies could provide significant assistance in alleviating some of these problems. For that reason, Congress has authorized \$660 million to be spent on IVHS over the next 6 years.

Goals for IVHS in the U.S. are:

- ◆ Improved safety
- ◆ Reduced congestion
- ◆ Increased and higher quality mobility
- ◆ Reduced environmental impact
- ◆ Improved energy efficiency
- ◆ Improved economic productivity
- ◆ A viable U.S. IVHS industry.

IVHS can be divided into the following five functional areas which are individually discussed below in Section 3:

1. Advanced Traffic Management Systems ("ATMS")
2. Advanced Traveler Information Systems ("ATIS")
3. Advanced Vehicle Control Systems ("AVCS")
4. Commercial Vehicle Operations ("CVO")
5. Advanced Public Transportation Systems ("APTS")

### 2.2 Requirements for Nationwide IVHS Service

Major requirements for IVHS solutions to gain widespread acceptance include having national network coverage, well designed human factors, features that meet the user's requirements, and an economical communications platform which includes automatic position-reporting technology.

IVHS America has stated:

"For the consumer, IVHS will provide products and services that will save time and make travel more convenient, safer, or quicker" . . . . "However, it would be a mistake to forget that the consumer is principally concerned with the personal benefits of a technology, not

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<sup>1</sup>IVHS America is a Federal Advisory Committee to the U.S. Department of Transportation, with 400 members in public sector, private sector and academia.

with issues of integration, standards or possible societal benefits. In the end, the consumers will determine the fate of IVHS by voting with their dollars. This suggests the need for very careful attention to human factors in the design of IVHS hardware, software and functionality. Public agencies, which will buy a substantial amount of IVHS hardware, software and systems, are crucial customers also".<sup>2</sup>

## **2.3 IVHS Service Applications**

The mobile information services provided by the IVHS technologies will benefit four main groups of users: consumers, dispatchers, drivers, and managers. Consumers will be able to get accurate estimated time of arrival ("ETA") for their deliveries by calling dispatchers of companies who have adopted IVHS technologies such as Automatic Vehicle Location (AVL) and data messaging. The mobile information capability will increase customer confidence, consequently expanding business for companies using the technologies. Dispatchers who currently rely on sketchy information, i.e., that certain vehicles in their fleet are somewhere in a designated zone, will be able to determine in real-time exactly which vehicle is closest to a call, and give drivers route and pickup/service instructions, as well as ETAs for their customers. Drivers will benefit from on-line route guidance and advice, as well as improved driver safety and security. Managers of fleets will be able to develop and manage systems that will optimally allocate people and resources.

## **2.4 Demand for Key Consumer Services within the IVHS Industry**

### **2.4.1 ERS Services**

In the United States forty vehicles break down and require roadside service every minute. The demand for Emergency Roadside Services (ERS) is evidenced by the fact that there are approximately 60 million paying auto club members in the U.S. The vehicles owned by these members represent approximately 65% of all registered automobiles. Auto clubs reported over 20 million calls for service in 1992.

### **2.4.2 SVR Services**

In that same minute four vehicles in the United States are stolen. Stolen vehicles continue to be the fastest growing non-violent crime in the United States (according to the FBI). The demand for Stolen Vehicle Recovery, (SVR), systems is driven by the 1.61 million vehicles, with an estimated aggregate value of \$7.6 billion, stolen in 1992.

### **2.4.3 Automobile Alarm Systems**

Demand for improved safety is further evidenced by the Vehicle Security Association projection that after market sales of anti-theft alarms rose from 2.5 million in 1985 to 5.2 million in 1992.

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<sup>2</sup>IVHS Report, section 1-13.

## **2.5 Demand for Key Commercial IVHS Services**

Market research reveals commercial users typically integrate technology into their operations to provide the benefits of increased efficiency and cost avoidance, and to remain competitive within their market segment. Within commercial fleets of 10 or more trucks, 105,000 companies with 7 million vehicles are already equipped with two-way communications systems of some type, in order to try to remain competitive.

Experts have estimated that IVHS is expected to relieve traffic congestion by up to 20%. The enhancement in economic productivity in the U.S. from the deployment of IVHS has been estimated at \$100 billion annually.<sup>3</sup>

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<sup>3</sup>IVHS America, "Strategic Plan for Intelligent Vehicle Highway Systems in the United States", May 20, 1992 at I 1-5

### **3.0 IVHS FUNCTIONS**

#### **3.1 Advanced Traffic Management Systems ("ATMS")**

ATMS refers to the merger of current and evolving traffic operations technologies and the application of those to both the highway and the vehicle. ATMS will collect, utilize, and disseminate real-time data on congestion on arterial streets and expressways, and will alert transit operators of alternative routes. ATMS represents the "Smart Highway" with which the "Smart Vehicle" will communicate. It is the foundation upon which all other IVHS technologies rely.

#### **3.2 Advanced Traveler Information Systems ("ATIS")**

ATIS systems acquire, analyze, communicate, and present information to assist travelers in moving from a starting location to their desired destination. The major component of ATIS is providing information to the driver of a vehicle. ATIS can employ visual and auditory presentations to inform drivers of their current locations, aid them in planning their routes, help guide them to their desired destinations and provide various informational services. ATIS may provide communications between the vehicle and an ATMS system that provides continuous information to the driver regarding traffic conditions, roadway congestion, alternate routes, parking and other up to date information. Real time information could include locations of accidents, weather and road conditions, optimal routes, recommended speeds and lane restrictions. The five major components of ATIS are: a navigation system, data communication transceivers, guidance systems, automated vehicle identification and emergency services.

##### **3.2.1 Navigation systems with electronic vehicle or traveler position determination.**

The electronic vehicle unit will receive or transmit a location "burst" which will be utilized in conjunction with a road map database to satisfy the navigation function. Low overall cost to the consumer will increase market penetration, which is required to allow such a system to be effective.

##### **3.2.2 Data communication transceivers providing information to and receiving information from traffic management centers.**

A two-way IVHS radio system should be capable of data and voice communications to satisfy this ATIS requirement totally. Protocol compatibility with traffic management center computer systems will be required to allow for "roaming" capability, and user friendly human factors will be required to promote wide market acceptance.

##### **3.2.3 Route planning and guidance systems.**

Systems, to fully meet this important feature of ATIS, should provide a simple menu driven program which would enable a driver to select the information required, i.e., optimum route, nearest parking, road and traffic conditions, etc. The request would be sent to an IVHS Service Provider, which would ascertain automatically the location of that vehicle. The requested information would then be obtained from the Service Provider's database and sent to the vehicle. The Service Provider would need to continuously update the area map with the latest traffic and road conditions which would be used in calculating the optimum routes and estimated travel times.



A driver could request the traffic and road conditions pertaining to the area local to the location of his vehicle, or plan a trip across states using this service.

### **3.2.4 Automated vehicle identification (AVI) for transit vehicle tracking, tolls and verification.**

Vehicles would transmit "bursts" when going through a toll plaza. For tolls and verification applications usually associated with a checkpoint, it would be possible to locally receive a short data message, which includes the vehicle ID, and perhaps a credit card or pre-paid debit number. Traffic movement at toll plazas and other checkpoints would be accelerated with alleviation of traffic congestion as a prime benefit.

### **3.2.5 Emergency (Mayday) services with signaling and response capabilities.**

One of the major features of the Mayday Service would be to enable a user to send a message that contains the problem and the location to an emergency service, i.e., allow an Auto Club, Police or Medical Provider, the user to speak with the operator, and make an emergency telephone call.

## **3.3 Advanced Vehicle Control Systems ("AVCS")**

AVCS systems combine sensors, computers and control systems in vehicles and in the infrastructure to warn and assist drivers or to intervene in the driving task. AVCS encompasses a broad range of products and systems. They have in common two unique features: (1) *Perceptual enhancement* - AVCS will incorporate sensors to augment human eyes and ears. These sensors will give the driver a better sense of any impending danger and the general situation in and around the vehicle; and (2) *Automated controls* - that are faster, more precise and more reliable than human reflexes.

## **3.4 Commercial Vehicle Operations ("CVO")**

CVO systems will apply various IVHS technologies to improve the safety and efficiency of commercial vehicles and fleet operations. Commercial vehicles include trucks, delivery vans, inter-city buses and emergency vehicles. CVO systems should increase safety, expedite deliveries, improve operational efficiency, improve incident response and decrease operational costs.

## **3.5 Advanced Public Transportation Systems ("APTS")**

APTS systems encompass the application of advanced electronic technologies to the deployment and operation of high occupancy, shared-ride vehicles including conventional buses, rail vehicles and para-transit vehicles.

Specific APTS features and products include:

- ◆ Mass transit and ride sharing information
- ◆ Ride-matching information that allows flexibility to change arrangements on short notice even during travel